

## WHAT IS CLAIMED IS:

1. A slidably movable member used in contact with lubricating oil, comprising:
  - a substrate; and
  - 5 a hard carbon-based film coated on a surface of said substrate, said hard carbon-based film having a surface section which contains at least one of nitrogen and oxygen in an amount ranging from 0.5 to 30 at%.
- 10 2. A slidably movable member as claimed in Claim 1, wherein said hard carbon-based film is a diamond film formed by a chemical vapor deposition process.
- 15 3. A slidably movable member as claimed in Claim 1, wherein the surface section of said hard carbon-based film contains at least one of nitrogen and oxygen in an amount ranging from 4 to 20 at%.
- 20 4. A slidably movable member as claimed in Claim 1, wherein said hard carbon-based film has a surface roughness lower than 0.1  $\mu\text{m}$ .
- 25 5. A slidably movable member as claimed in Claim 1, wherein said hard carbon-based film has a hardness Hv higher than 1000.
- 30 6. A slidably movable member as claimed in Claim 1, wherein said hard carbon-based film has a thickness ranging from 1 to 10  $\mu\text{m}$ , wherein said hard carbon-based film has a coefficient of friction of not higher than 0.07 in a condition where said hard carbon-based film is dipped in a lubricating oil.

7. A slidably movable member as claimed in Claim 1, wherein said substrate is formed of a material selected from the group consisting of silicon nitride and steel.
- 5 8. A slidably movable member as claimed in Claim 1, wherein said hard carbon-based film is formed of a material selected from the group consisting of diamond polycrystal, amorphous carbon, and diamond like carbon.
- 10 9. An adjusting shim used in a valve operating mechanism of an internal combustion engine, comprising:  
a substrate; and  
a hard carbon-based film coated on a surface of said substrate, said hard carbon-based film having a surface section which contains at least one of nitrogen and oxygen in an amount ranging from 0.5 to 30 at%.
- 15 10. A slidably movable member used in contact with lubricating oil, comprising  
a substrate; and  
a hard carbon-based film coated on a surface of said substrate, said hard carbon-based film having a surface section which contains hydrogen in an amount of not more than 10 at%.
- 20 11. A slidably movable member as claimed in Claim 1, wherein said hard carbon-based film is formed by one of a carbon ion beam process, a thermal chemical vapor deposition process, an ion plating process, and a sputtering process.
- 25 12. A slidably movable member used in contact with lubricating oil, comprising:  
a substrate; and

a hard carbon-based film coated on a surface of said substrate, said hard carbon-based film having a surface section which contains at least one of nitrogen in an amount ranging from 0.5 to 30 at%, oxygen in an amount ranging from 0.5 to 30 at%, and 5 hydrogen in an amount of not more than 10 at%.

13. A method of producing a slidably movable member used in contact with lubricating oil, comprising:  
10 preparing a substrate;  
coating a hard carbon-based film on a surface of the substrate by a chemical vapor deposition process; and  
causing a surface section of the hard carbon-based film to contain at least one of nitrogen and oxygen in an amount ranging from 0.5 to 30 at% by one of a plasma treatment and an ion 15 implantation process.

14. A method of producing a slidably movable member used in contact with lubricating oil, comprising:  
15 preparing a substrate; and  
coating a hard carbon-based film on a surface of the substrate by one of a carbon ion beam process, a thermal chemical vapor deposition process, an ion plating process, and a sputtering process, to cause a content of hydrogen in a surface section of the hard carbon-based film to fall within a range of not more than 10 20 at%.  
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